



<i>Product Specification</i>	<i>Model:</i>	AWY-240320T28P05	<i>Rev. No.</i>	<i>Issued Date.</i>	<i>Page.</i>
			A	2011/12/26	1 / 19

**Thin Film Transistor LCD MODULE**  
**MODEL: AWY-240320T28P05**  
**Customer's No.:**

Acceptance

10 -1 Floor, No.192, Tahtung Road,  
Sec. 3, Hsi-Chih City,  
Taipei Hsien, Taiwan

Approved and Checked by

Approved by	Checked by		Made by



<i>Product Specification</i>	<i>Model:</i>	AWY-240320T28P05	<i>Rev. No.</i>	<i>Issued Date.</i>	<i>Page.</i>
			A	2011/12/26	2 / 19

# CONTENTS

1.	Scope	3
2.	Features	3
3.	Mechanical specification	3
4.	Dimensional outline	4
5.	Maximum rating	5
6.	Electrical characteristics	5
7.	Electro-optical characteristics	6
8.	I/O terminal	8
9.	Quality level	11
10.	Reliability	16
11.	Handling precautions	17
12.	Precaution for use	19
13.	Revision History	19



Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	3 / 19

## 1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by ACROWISE Technology Development.

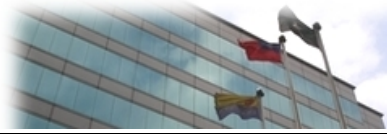
If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution.

## 2. Features

Item	Features
Display format	240X (RGB)(H) X 320(V) dots
LCD Type	A-Si TFT , Transmissive
Pixel arrangement	RGB vertical strip
Display colors	65K/262K
Viewing direction	12 O'clock
Structure	COG + FPC + Backlight+Touchpanel
Interface	8080 system 8/9/16bit data bus
Back light	4-Chip LED (White)
IC	IL19341

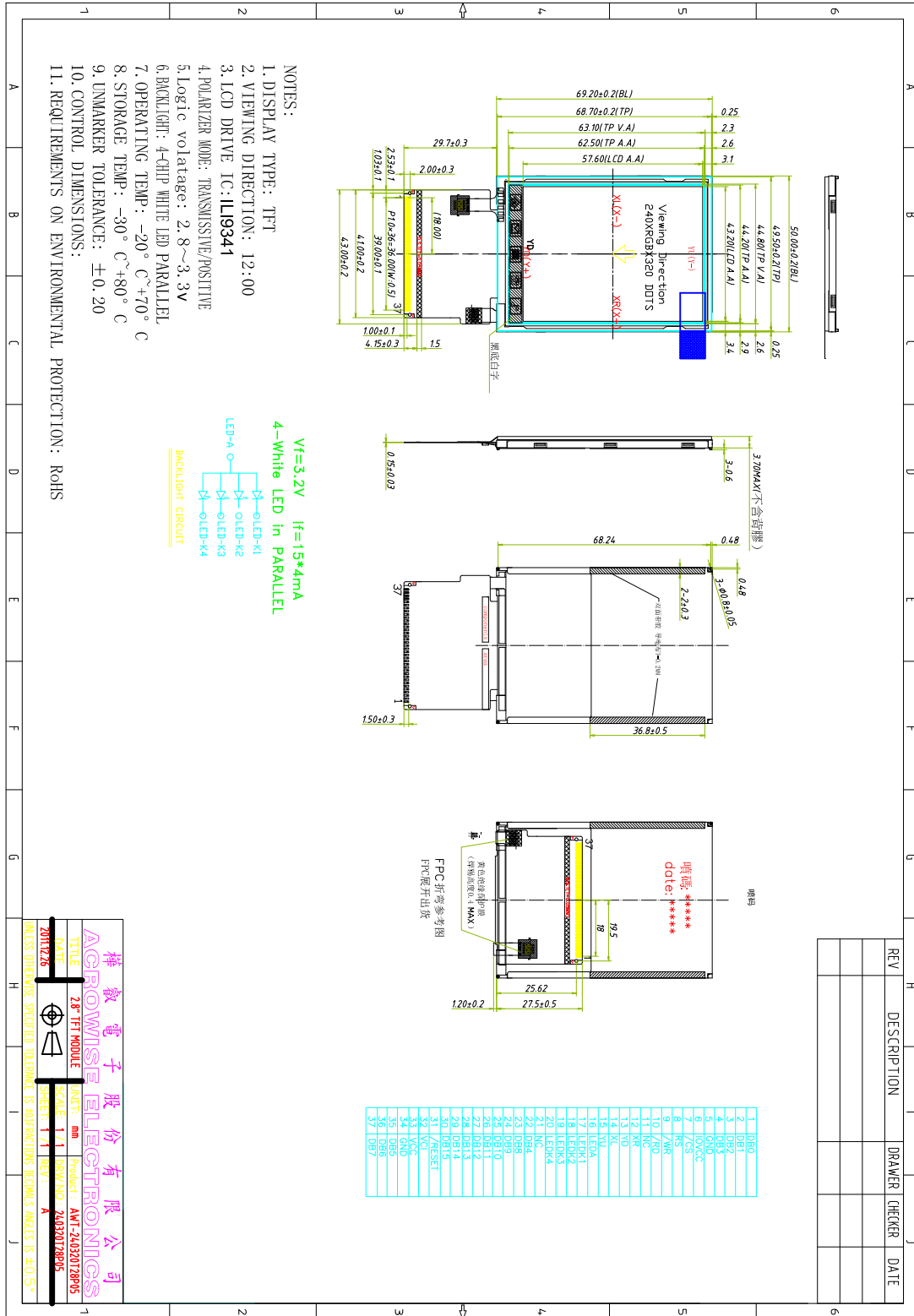
## 3. Mechanical specification

Item	Specifications	Unit
Dimensional Outline	50.0(W) X 69.2(H) X 3.7(Max) (Exclude D.S.T)	Mm
Active area	43.2(W) X 57.6(H)	Mm
Pixel Pitch	0.18(W) X 0.18(H)	Mm
Weight	T.B.D	G



Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	4 / 19

## 4.Dimension outline





Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	5 / 19

## 5. Maximum rating

[VSS=0V]

Item	Symbol	Min.	Max.	Unit
Supply voltage	VCI	-0.3	4.6	V
Supply voltage	IOVCC	-0.3	4.6	V
Input voltage	VI	-0.3	VCC + 0.3	V
Operating temperature	T <sub>OP</sub>	-20	70	°C
Storage temperature	T <sub>STG</sub>	-30	80	°C
Humidity	---	---	90	%RH

Note 1: Temp. >60°C , 90% RH MAX

Temp. >60°C , Absolute humidity shall be less than 90% RH at 60

Note 2: If the LSI is used above these absolute maximum ratings, it may become permanently damaged.

## 6. Electrical characteristics

### 6-1. TFT-LCD Module Electrical characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Input voltage range	VCI	2.5	2.8	3.3	V	-
Input voltage "H" level	VIH	0.7* IOVCC	-	IOVCC	V	-
Input voltage "L" level	VIL	0	-	0.3* IOVCC		-
output voltage "H" level	VOH	0.8* IOVCC	-	IOVCC		IOH=-1.0mA
output voltage "L" level	VOL	0	-	0.2* IOVCC		IOL=1.0mA
Current 1	VI1	-	-	-	mA	Normal mode
Current 2	VI2	-	-	-	mA	Sleep mode

Note:

1、Test Condition: IOVCC = 1.65 ~ 3.3V

### 6-2.Back-Light Electrical characteristics

The backlight system is an four-lighting type with Five white LED (Light Emitting Diode).

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I <sub>f</sub>	-	60	-	mA	-
Forward Voltage	V <sub>f</sub>	3.0	3.2	3.4	V	I <sub>f</sub> =60mA

Note (1):Four LEDs in parallel type.



Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	6 / 19

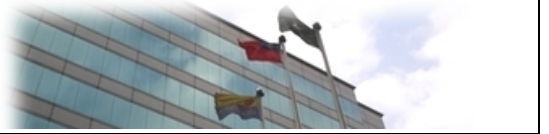
## 7. Electro-optical characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (2).

Measuring equipment: LCD-7200, BM-5A, PR-650, EZ-Contrast

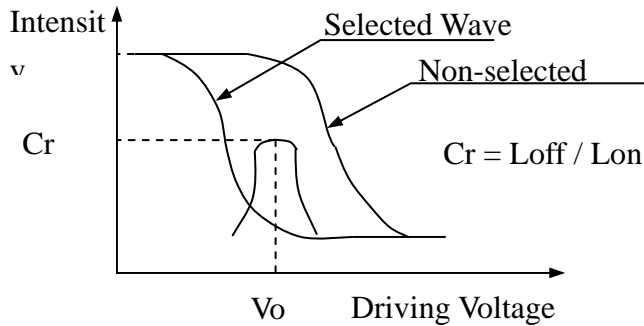
(Ta = 25 ± 2°C, Reference only)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness		YL	$\theta = \psi = 0^\circ$	160	200	-	nits	
Contrast ratio (Center point)		C/R		-	300	-	-	Note(4)
Response time	Rising: Tr	Tr		-	10		msec	Note(2)
	Falling: Tf	Tf		-	15			
Color Chromaticity (CIE 1931)	White	Wx		0.278	0.308	0.338	-	C light
		Wy		0.309	0.339	0.369		
	Red	Rx		0.622	0.652	0.682		
		Ry		0.301	0.331	0.361		
	Green	Gx		0.284	0.314	0.344		
		Gy		0.545	0.575	0.605		
	Blue	Bx	0.108	0.138	0.168			
		By	0.102	0.132	0.162			
Viewing angle		$\theta F(D)$	C/R ≥ 10	-	-	-	Degrees	Note(3)
		$\theta B(U)$		-	-	-		
		$\phi R$		-	-	-		
		$\phi L$		-	-	-		

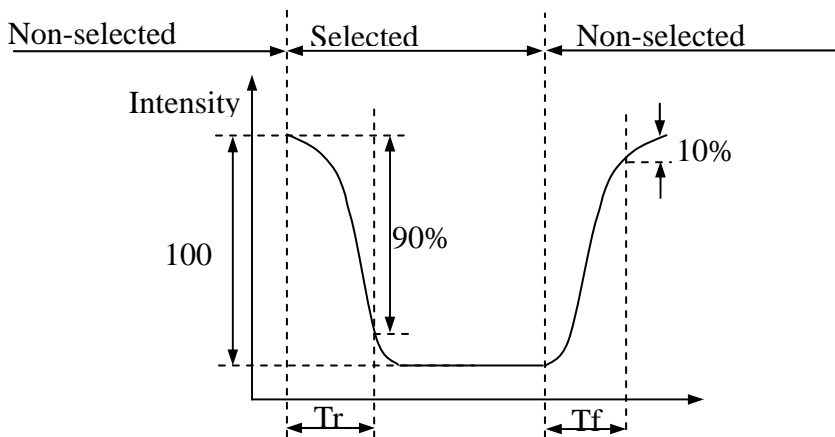


Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	7 / 19

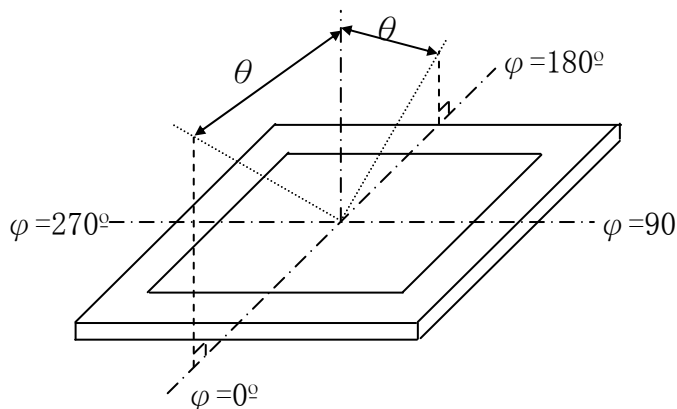
**Note1: Definition of Operation Voltage (Vop)**



**Note2: Definition of Response Time (Tr, Tf)**



**Note3: Definition of Viewing Angle**



**Note4: Definition of Contrast Ratio:**

CR = White Luminance (ON) / Black Luminance (OFF)



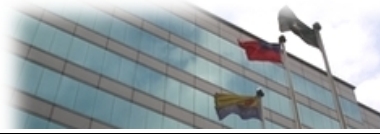
Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	8 / 19

## 8. I/O terminal

### 8-1. I/O connection

PIN NO.	PIN NAME	DESCRIPTION
1	DB0	Data bus
2	DB1	
3	DB2	
4	DB3	
5	GND	Power ground
6	IOVCC	I/O Power supply
7	/CS	Chip select signal input terminal, Active at 'L'
8	RS	Register select signal input terminal: RS='H': control register; RS='L': index or status register.
9	/WR	Write signal input terminal, Active at 'L'.
10	/RD	Read signal input terminal, Active at 'L'.
11	NC	NC
12	XR	TP control pin
13	YD	
14	XL	
15	YU	
16	LEDA	LED backlight anode(+)
17	LEDK1	LED backlight kathode (-)
18	LEDK2	
19	LEDK3	
20	LEDK4	
21	NC	NC
22	DB4	Data bus
23	DB8	
24	DB9	
25	DB10	
26	DB11	
27	DB12	
28	DB13	
29	DB14	



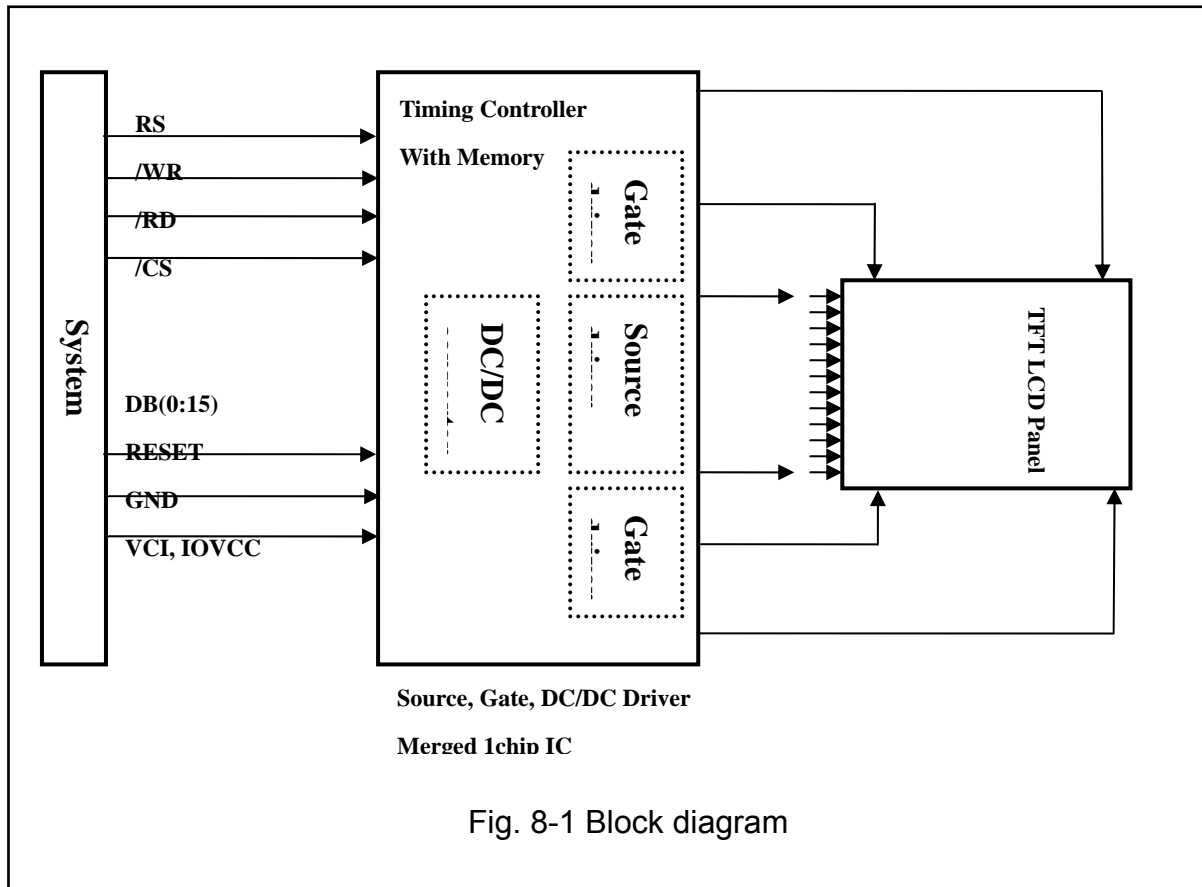


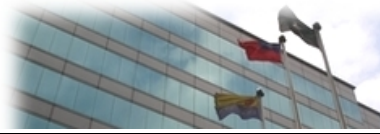
Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	9 / 19

30	DB15	
31	/RESET	Reset signal input terminal, active at 'L'
32	VCI	power supply.
33	VCC	power supply.
34	GND	Power ground
35	DB5	Data bus
36	DB6	
37	DB7	

## 8-2. Circuit block diagram

The circuit block diagram is shown in fig. 8-1.

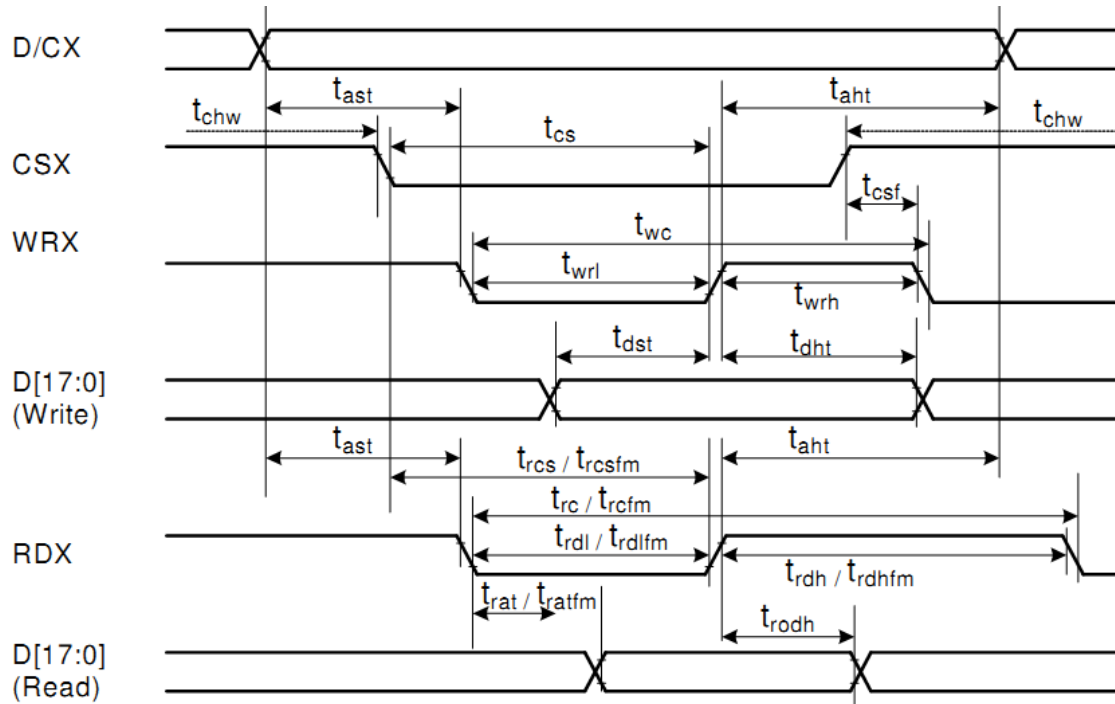




Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	10 / 19

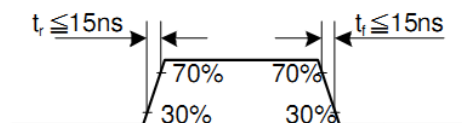
### 8-3. AC\_CHARACTERISTICS

#### 80 Parallel Write Interface Characteristics



Signal	Symbol	Parameter	min	max	Unit	Description
DCX	$t_{ast}$	Address setup time	0	-	ns	
	$t_{aht}$	Address hold time (Write/Read)	0	-	ns	
CSX	$t_{chw}$	CSX "H" pulse width	0	-	ns	
	$t_{cs}$	Chip Select setup time (Write)	15	-	ns	
	$t_{rcs}$	Chip Select setup time (Read ID)	45	-	ns	
	$t_{rcsfm}$	Chip Select setup time (Read FM)	355	-	ns	
WRX	$t_{csf}$	Chip Select wait time (Write/Read)	10	-	ns	
	$t_{wc}$	Write cycle	66	-	ns	
	$t_{wrh}$	Write Control pulse H duration	15	-	ns	
RDX (FM)	$t_{wrl}$	Write Control pulse L duration	15	-	ns	
	$t_{rcfm}$	Read Cycle (FM)	450	-	ns	
	$t_{rdhfm}$	Read Control H duration (FM)	90	-	ns	
RDX (ID)	$t_{rdlfm}$	Read Control L duration (FM)	355	-	ns	
	$t_{rc}$	Read cycle (ID)	160	-	ns	
	$t_{rdh}$	Read Control pulse H duration	90	-	ns	
D[17:0], D[15:0], D[8:0], D[7:0]	$t_{rdl}$	Read Control pulse L duration	45	-	ns	
	$t_{dst}$	Write data setup time	10	-	ns	
	$t_{dht}$	Write data hold time	10	-	ns	
	$t_{rat}$	Read access time	-	40	ns	For maximum CL=30pF
	$t_{ratfm}$	Read access time	-	340	ns	For minimum CL=8pF
	$t_{rodh}$	Read output disable time	20	80	ns	

Note:  $T_a = -30$  to  $70$  °C,  $V_{DDI}=1.65V$  to  $3.3V$ ,  $V_{CI}=2.5V$  to  $3.3V$ ,  $V_{SS}=0V$





<i>Product Specification</i>	<i>Model:</i>	AWY-240320T28P05	<i>Rev. No.</i>	<i>Issued Date.</i>	<i>Page.</i>
			A	2011/12/26	11 / 19

## 9. Quality level

### 9-1. Inspection conditions

9-1-1. The environmental conditions for inspection shall be as follows.

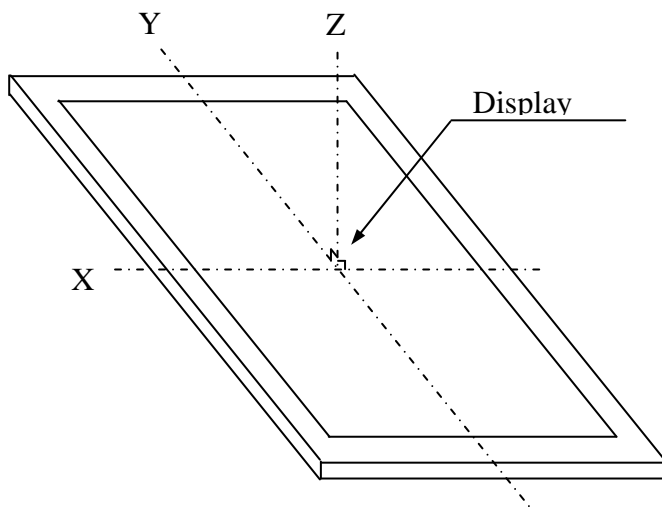
Room temperature :  $20 \pm 3^{\circ}\text{C}$

Humidity :  $65 \pm 20\% \text{RH}$

9-1-2. The external visual inspection

The inspection shall be performed by using a single 20W fluorescent lamp for illumination and the distance from LCD to eyes of the inspector should be 30cm or more.

9-1-3. (1) Light method

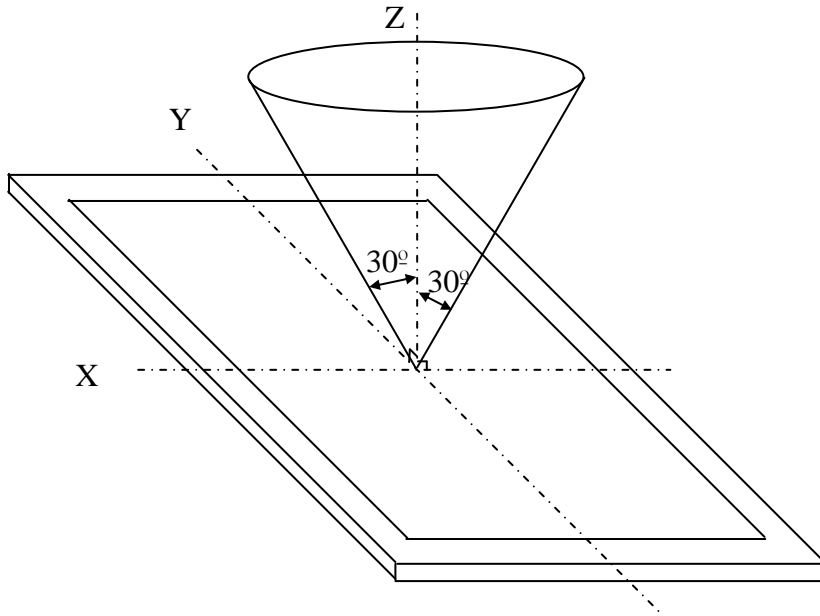


Fluorescent lamp set the



Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	12 / 19

(2) Inspection distance and angle



Inspection should be performed within  $\phi$  ( $\phi$  is usually 30 degree ) from Z axis to each X and Y axis. Inspection distance of any direction within  $\phi$  must be kept  $30\pm 5\text{cm}$  to the display surface.

9-2. Sampling procedures for each item's acceptance level table.

Defect type.	Sampling procedures	AQL
Major defect	MIL-STD-105E Inspection level 1 Normal inspection Single sample inspection	0.65
Minor defect	MIL-STD-105E Inspection level 1 Normal inspection Single sample inspection	1.5

9-3. Classification of defects

9-3-1. Major defects: A major defect refers to a defect that is not considered to substantially degrade usability for product applications.

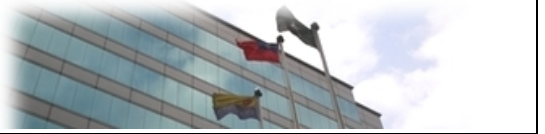
9-3-2. Minor defect: A minor defect refers to a defect which is not considered to substantially degrade product application or a defect which deviates from existing standards almost unrelated to the effective use of the product or it's operation.



Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	13 / 19

**9-4. Incoming Inspection standards**

Item	Criterion for defects	Defect type	
1) Display on inspection	(1) Non display (2) Vertical line is deficient (3) Horizontal line is deficient (4) Cross line is deficient	Major	
2) Black/White spot	Size Ø (mm)	Acceptable number	
	Ø ≤ 0.20	Lgnore (note)	
	0.20 < Ø ≤ 0.30	3	
	0.30 < Ø	0	
Note: NG if four or more spot crowd together		Minor	
3) Black/White line	Length(mm)	Width(mm)	Acceptable number
	L < 10	W < 0.05	Lgnore
	L < 10	0.05 ≤ W < 0.1	1
	L < 10	0.10 ≤ W	0
	L ≥ 10		0
Defects separate at interval if 30mm each other		Minor	
Item	Criterion for defects	Defect type	
4) Display pattern		Minor	
	<table border="1"> <tr> <td><math>(A+B)/2 \leq 0.3</math></td> <td><math>0 &lt; C</math></td> <td><math>(D+E)/2 \leq 0.15</math></td> </tr> </table> <p>Note: 1. Up to 5 damages acceptable. 2. NG if there're two or more pinholes per digit</p> <p style="text-align: right;">[Unit: mm]</p>		$(A+B)/2 \leq 0.3$
$(A+B)/2 \leq 0.3$	$0 < C$	$(D+E)/2 \leq 0.15$	



Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	14 / 19

5) Spot-like contrast irregularity	Size Ø (mm)	Acceptable number	Minor
	Ø≤0.2	Lgnore (note)	
	0.2 <Ø≤0.4	3	
	0.4<Ø0.6	2	
	0.6<Ø	0	
Note: 1) Conformed to limit samples. 2) Defects separate at intervals of 50mm each other			
6) Bubble in polarizer	Size Ø (mm)	Acceptable number	Minor
	Ø≤0.2	Lgnore (note)	
	0.2 <Ø≤0.4	3	
	0.4<Ø0.6	2	
	0.6<Ø	0	
Note: 1) Conformed to limit samples. 2) Defects separate at intervals of 50mm each other			
7) Scratches and dent on the polarizer	Scratches and dent on the polarizer shall be in the accordance with. "2) Black/White spot. 3) Black/White line".		Minor
8) Stains on LCD panel surface	Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning too		Minor
9) Rainbow color	The rainbow color of limited sample is allowed in the optimum contrast on state within the active area		Minor
10) Threshold voltage coloration	Non-uniform brightness at optimum contrast is not allowed and the criterion abides by standard samples		Minor
11) Viewing area encroachment	Polarizer edge or line is visible in the opening viewing area due to polarizer shortness or sealing line.		Minor
12) Bezel appearance	Rust and deep damage which are visible in the bezel is rejectable.		Minor



Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	15 / 19

13) Defect or land surface contact (Poor soldering)	(1) Failure to mount parts (2) Parts not in the specifications are mounted (3) Polarity for example is reversed	Major
15) Parts alignment	(1) LSI, IC lead width is more then 50% beyond pad outline. (2) Chip component is off center and more then 50% of the leads is off the pad outline.	Minor Minor
16) Conductive foreign matter (Solder ball Solder chips)	(1) $0.45 < \varnothing \quad N \geq 1$ (2) $0.30 < \varnothing \leq 0.45 \quad N \geq 1$ $\varnothing$ : Average diameter of solder ball (unit :mm) (3) $0.50 < L \quad N \geq 1$ L : Average length of solder ship (unit :mm)	Major Minor Minor
17) PWB pattern damage	(1) Deep damage is found on copper foil and the pattern is nearly broken. (2) Damage on copper foil other than (1) above.	Minor Minor
18) Faulty PWB correction	(1) Due to PWB copper foil pattern burnout, the pattern is connected, using a jumper wire for repair; 2 or more places are corrected per PWB. (2) Short circuited part is cut, and no resist coating has been performed.	Minor Minor
19) Bezel claw	Bezel claw missing or not bent	Minor
20) Indication of name plate (sampling indication label)	(1) Failure to stamp or label error, or not legible. (all acceptable if legible) (2) The separation is more than 1/3 for indication discoloration In which the characters can be checked.	Minor



Product Specification	Model:	AWY-240320T28P05	Rev. No.	Issued Date.	Page.
			A	2011/12/26	16 / 19

## 10. Reliability

### 10-1. Life time

50,000 Hrs (25°C in the room without ray of sun)

### 10-2. Items of reliability

Item	Condition	Criterion
1) High temperature operating	60 °C 96 hrs	No cosmetic failure are allowable.
2) Low temperature operating	-20 °C 96 hrs	Contrast ratio should be between initial value ±10% Total current consumption should be below double of initial value.
3) Humidity	40 °C, 90%RH, 96 hrs	
4) High temperature storage	70 °C 96 hrs	No cosmetic failure are allowable.
5) Low temperature storage	-30 °C 96 hrs	Contrast ratio should be between initial value ±20%
6) Thermal shock storage	25 °C→-30 °C→25 °C→80 °C 5(min) 30(min) 5(min) 30(min) 5 cycle, 55~60%RH	Total current consumption should be below double of initial value.
7) Vibration	10~55~10hz Amplitude: 1.5mm 2hrs for each direction (X,Y,Z)	No defect in cosmetic and operational function is allowable.  Total current consumption should be below double of initial value.

Note: 1) No cosmetic failure' means there must be no permanent cosmetic defect and does not include any recoverable defect after 24 hours.

Note: 2) After any reliability test which is stated above, let it alone unpowered for 24 hours or more in a room temperature and check the criterion.





<i>Product Specification</i>	<i>Model:</i>	AWY-240320T28P05	<i>Rev. No.</i>	<i>Issued Date.</i>	<i>Page.</i>
			A	2011/12/26	17 / 19

## 11. Handling precautions

### 11-1. Mounting method

The LCD panel of ACROWISE Technology LCD module consists of two thin glass plates with polarizers which easily get damaged and the module is so constructed as to be fixed by utilizing fitting holes in the plastic cases. Extreme care should be used when handling the LCD modules.

### 11-2. Caution of LCD handling and cleaning

When cleaning the display surface, use soft cloth with solvent [recommended below] and wipe lightly

- ◆ Isopropyl alcohol
- ◆ Ethyl alcohol
- ◆ Trichlorotrifluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- ◆ Water
- ◆ Ketone
- ◆ Aromatic

### 11-3. Caution against static charge

The LCD module uses CMOS LSI drivers, so we recommend that you; Connect any unused input terminal to VDD or VSS, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

### 11-4. Packing

- ◆ Module employs LCD elements, and must be treated as such. Avoid intense shock and falls from a height.
- ◆ To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

### 11-5. Caution for operation

- ◆ It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life.

An electrochemical reaction due to direct current drive should be avoided.



<i>Product Specification</i>	<i>Model:</i>	AWY-240320T28P05	<i>Rev. No.</i>	<i>Issued Date.</i>	<i>Page.</i>
			A	2011/12/26	18 / 19

- ◆ Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's show dark color in them.

However those phenomena do not mean malfunction or out of order with LCD's, Which will come back in the specified operating temperature.

- ◆ If the display area is pushed hard during operation. Some font will be abnormally displayed but it resumes normal condition after turning off once.
- ◆ A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the relative condition of 40 °C, 50%RH or less is required.

#### 11-6. Storage

In the case of storing for a long period of time [for instance, for years] for the purpose or replacement use the following ways are recommended.

- ◆ Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.
- ◆ Placing in a dark place where neither exposure to direct sunlight nor light is, keeping the storage temperature.
- ◆ Storing with no touch on polarizer surface by the anything else.

[It's recommended to store them as they have been contained in the inner container at the time of delivery from us.

#### 11-7. Safety

- ◆ It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- ◆ When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.



<i>Product Specification</i>	<i>Model:</i>	AWY-240320T28P05	<i>Rev. No.</i>	<i>Issued Date.</i>	<i>Page.</i>
			A	2011/12/26	19 / 19

## 12. Precaution for use

12-1. A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity.

Judgement by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

12-2. On the following occasions, The handling of problem should be decided through discussion and agreement between responsible of the both parties.

- ◆ When a question is arisen in this specifications.
- ◆ When a new problem is arisen this is not specified in these specifications.
- ◆ When an inspection specifications change or operating condition change in customer is reported to SDD, and some problem is arisen in this specification due to the change.
- ◆ When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

## 13. Revision History

Version No.	Date	Page	Description
A	2011-12-26	ALL	New Created